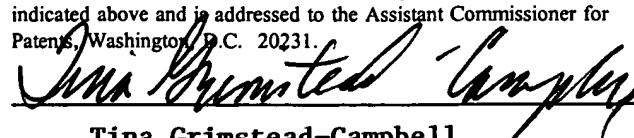


APPENDIX I

"EXPRESS MAIL" Mailing Label Number EI267842785US

Date of Deposit October 24, 1997

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Tina Grimstead-Campbell

APPENDIX I

Checks Done On Renumbered Java Byte Codes

Get the instruction. The numeric value of the instruction implicitly contains the instruction type:

```
insn = getpc(-1);
```

Implement some pre-execution checks based on this:

```
/*
 * Check input stack state. By renumbering the byte codes we can
 * perform the necessary security checks by testing if the value of the
 * byte code (and hence the byte code) belongs to the correct group
 */
if (insn <= TYPE9_END) {
    if (insn <= TYPE1_END) {
        check_stack_int(1);
    }
    check_stack_int(0);
}
else if (insn <= TYPE12_END) {
    check_stack_ref(0);
}
else if (insn <= TYPE11_END) {
    push(1)
}
```

Finally, implement some post execution checks:

```
/*
 * Set output stack state.
*/
if (insn <= TYPE8_END) {
    if (insn <= TYPE6_END) {
        if (insn >= TYPE6_START) {
            pop(1);
        }
        pop(1);
    }
    pop(1);
}
else if (insn <= TYPE10_END) {
    set_stack_int(0);
}
else if (insn >= TYPE11_START && insn <= TYPE16_END) {
    set_stack_ref(0);
}
```

Reordering of supported Java byte codes by type

```
/* TYPE 3 */

#define s_POP2          0
#define s_IF_ICMPEQ    1
#define s_IF_ICMPNE    2
#define s_IF_ICMPLT    3
#define s_IF_ICMPGE    4
#define s_IF_ICMPGT    5
#define s_IF_ICMPL    6
#define s_IF_ACMPEQ   7
#define s_IF_ACMPNE   8

/* TYPE 6 */

#define TYPE6_START     9
#define s_SASTORE      9
#define s_AASTORE     10
#define s_BASTORE     11
#define TYPE6_END      12

/* TYPE 1 */

#define s_IADD         13
#define s_ISUB         14
#define s_IMUL         15
#define s_IDIV         16
#define s_IREM         17
#define s_ISHL         18
#define s_ISHR         19
#define s_IUSHR        20
#define s_IAND         21
#define s_IOR          22
#define s_IXOR         23
#define TYPE1_END      23

/* TYPE 2 */

#define s_ISTORE       24
#define s_POP          25
#define s_IFEQ         26
#define s_IFNE         27
#define s_IFLT         28
#define s_IFGE         29
#define s_IFGT         30
#define s_IFLE         31
#define s_TABLESWITCH 32
#define s_LOOKUPSWITCH 33
#define s_IRETURN      34

/* TYPE 7 */

#define s_SALOAD       35
#define s_AALOAD       36
#define s_BALOAD       37

/* TYPE 9 */

#define s_INEG          39
#define s_INT2BYTE     40
#define s_INT2CHAR     41
#define TYPE9_END      41

/* TYPE 8 */

#define s astore       42
#define s areturn      43
```

```

#define s_ATHROW      44
#define s_IFNULL      45
#define s_IFNONNULL   46

#define TYPE8_END     46

/* TYPE 12 */

#define s_ARRAYLENGTH 47
#define s_INSTANCEOF   48

#define TYPE12_END    48

/* TYPE 10 */

#define s_SIPUSH       49
#define TYPE10_END     49

/* TYPE 5 */

#define s_ILOAD        50
#define s_ALOAD        51

/* TYPE 11 */

#define TYPE11_START   52
#define s_ACONST_NULL  52
#define s_LDC2         53
#define s_JSR          54
#define s_NEW          55

#define TYPE11_END     55

/* TYPE 16 */

#define s_NEWARRAY    56
#define s_CHECKCAST   57

#define TYPE16_END     57

/* TYPE 13 */

#define s_DUP          58
#define s_DUP_X1       59
#define s_DUP_X2       60
#define s_DUP2         61
#define s_DUP2_X1      62
#define s_DUP2_X2      63
#define s_SWAP         64

/* TYPE 14 */

#define s_INVOKEVIRTUAL 65 /* 01000001 */
#define s_INVOKEONVIRTUAL 66 /* 01000010 */
#define s_INVOKESTATIC 67 /* 01000011 */
#define s_INVOKEINTERFACE 68 /* 01000100 */

/* TYPE 15 */

#define s_GETSTATIC    69
#define s_PUTSTATIC    70
#define s_GETFIELD     71
#define s_PUTFIELD     72

/* TYPE 4 */

#define s_NOP          73
#define s_IINC         74
#define s_GOTO         75
#define s_RET          76
#define s_RETURN       77

```